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[redacted] In replying please address: ILLEGIB

[redacted] 25X1

March 6, 1959

Dear Sir:

In accord with recent discussions with your technical representative, we are submitting herewith a proposed program of research directed toward the investigation of an experimental specialized torque-measuring and -indicating system.

Under Work Order No. III, Task Order No. CC, we recently investigated the feasibility of using selected instrumentation as an accessory to your operating representatives' special two-component tool [redacted] 25X1. One type of instrumentation studied involved a strain-gage technique for measuring and indicating torques exerted on the moving component [redacted] 25X1 The experimental setup used to investigate this technique consisted essentially of a 6-inch-long lever attached to the handle of the moving component [redacted] 25X1 strain gages bonded to the surface of the lever; and an amplifying and indicating apparatus. In the operation of [redacted] 25X1 connected into this experimental system in this manner, torque applied to the end of the lever bent the lever slightly and thus caused some strain, which was sensed by the strain gages. The corresponding strain signal from

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the gages was then fed to the amplifying and indicating apparatus, which was a conventional piece of laboratory equipment; and a plot indicating the variation in torque was automatically drawn.

This experimental system was demonstrated to your technical and operating representatives on February 4, 1959. Although this system interfered with the "feel" of the operator when using [redacted] the basic idea of observing torque changes was shown to be useful. Further, it was mutually agreed that the use of a system of this type was feasible and practical. Your technical representative indicated an interest in our giving further consideration to the development of this type of system. Outlined herein is a proposed program of research directed toward achieving this objective. 25X1

As currently visualized, the principal features of a satisfactory torque-measuring and -indicating system for the intended application include the following:

(1) Sufficient range and sensitivity should be provided so as to permit application of such a system to operations [redacted] interest. 25X1

(2) The design should permit the retention, as nearly as possible, of those features of the [redacted] that are conducive to operator "feel". 25X1

(3) The system should be small, lightweight, self sufficient, and reliable.

In our February 4 meeting with your technical and operating representatives, selected ideas were suggested for incorporating strain gages in the round (perhaps 2 inches in diameter) handle of the moving component [ ] this might be done in a manner such that [ ] would feel the same as it did without the torque-sensing device present, and could actually be used with or without it. As currently contemplated, the effort under the proposed program would be initiated by designing an [ ] which would incorporate some of those already conceived features. The torque data obtained under Work Order No. III would be used in establishing dimensions and other pertinent details. Further, this design would be based on well-known torque-strain relationships; and also on a compromise between provision of sensitivity sufficient to drive some electrical-type indicator, and the desire for a tool which would not be so flexible that its "feel" would be markedly affected.

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Concurrently, some thought would be given to additional possible means, other than strain gages, for sensing the torque changes. It is still felt that the strain-gage technique is at least as feasible as any other technique. However, we have a few pertinent ideas which merit cursory examination.

After the above-described design was discussed with your technical representative, an experimental model would be prepared, probably with strain gages incorporated, and subsequently evaluated using a laboratory-type strain indicator. The results of the evaluation would probably lead to minor design changes, and subsequent

re-evaluation of the experimental model, until, within the limits of the time and funds provided, a suitable experimental model was obtained.

Then, the proposed effort would be directed toward the design of an experimental electrical indicating system which would be simple, small, reliable, and portable. Consideration would first be given to the simplest circuits and instruments which might satisfy the requirements. For example, a simple battery for a power source and a portable microammeter (galvanometer) might be tried, although there are reasons to suspect that the indications provided by such a system might not be sufficiently stable. If necessary, the design and preparation of some type of special experimental indicator would be considered next; this would include investigating and evaluating the possibility that commercially available instruments or components might be adaptable, with or without minor modifications. Most commercially available strain-gage indicators are more elaborate than the device of interest has to be. However, such instruments, with minor modifications, might provide the most economical solution to the problem.

If the application of such instruments or components appeared to be favorable, then the additional research that might be conducted under the proposed program would depend upon the cost of such items and the amount of unexpended funds at that time. If sufficient funds were still available, the appropriate items would be purchased and assembled into an experimental model, and this

experimental unit would be evaluated [redacted], 25X1
We currently believe that it may be possible to reach this stage in this investigation within the limits of the funds and time provided by the proposed contract.

On the other hand, if this is not possible within the limits of the proposed contract, then it is likely that at the conclusion of the proposed research period, definite recommendations could be made with regard to the performance of additional research directed toward the development of a prototype of an experimental torque-measuring and -indicating system. Such research, of course, would have to be provided for under an additional contractual arrangement.

Your technical representative would be kept informed of the activity under the proposed program by discussions via the telephone and during his periodic visits. At the conclusion of the proposed research period, a letter report would be submitted that summarized the highlights of the activity performed and the results obtained, as well as any pertinent recommendations.

We propose to undertake this effort over a period of four months, starting on the date of acceptance of authorization from the Contracting Officer to proceed. The proposed investigation could be conducted under Task Order No. CC. The Work Order would be a period-basis research agreement; it could be similar in form to that used previously under Task Order No. CC and the same administrative procedures would be followed. The Work Order would require only that

the research be directed toward the objective outlined above, within the limits of the time and funds provided.

It is estimated that an appropriation of $2,998, including the fixed fee, is needed to fund the proposed program for the four-month period. A general breakdown of the estimated costs is attached.

If any additional information is needed, please let us know. You may direct any inquiries of a contractual nature to [redacted] at Extension 159. 25X1

Very truly yours,

[redacted] 25X1

EES:mlm

In Duplicate

Proposal of [redacted] to the U. S. Government. 25X1

For Research on An Investigation of a Specialized Torque-Measuring and -Indicating System.

Based upon a period-basis Contract for a research period of 4 months.

(Including time for submission of all reports. The proposed contract will not provide for earlier conclusion of the research.)

ESTIMATED COSTS

We expect that the cost of this research for the period indicated above may be distributed approximately as set forth hereon, subject to the understanding that this allocation is merely an estimate, and actual costs incurred may vary from the categories shown. We have determined that these estimates are reasonable and consistent with [redacted] established policies in its research for the various Government agencies, which policies are briefly discussed below and will be followed in determination of our actual costs hereunder. 25X1

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Materials & Supplies, etc.

(Including any equipment which may be purchased as necessary in performance of the research. Charges of $25 or less are excluded from this item.)

Use of Equipment and Technical Services, Travel, and Misc.

(Including applicable costs of technical research and service divisions, and use of technical equipment, except that any undistributed balances of these accounts will be included in overhead. Cost of travel includes reasonable actual subsistence expenses and the actual cost of transportation. An allowance of up to 8¢ per mile for all necessary travel by privately owned conveyance is included in lieu of the cost of such travel.)

Salaries & Wages

(Including our predetermined accrual for vacation, holiday, and sick-leave pay, pensions, and social security.)

Type of Employee	*No. of Man-Months*	*Estimated Cost*
Supervision	1/4	
Research Engineers	1	
Lab. Assistants	1	
Steno., Clerical, Shop & Photo., etc.	1/4	
Total Salaries & Wages		

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Overhead

60 per cent of salaries and wages, as they are defined above. Provisional monthly reimbursement will be at the rate of 60 per cent of salaries and wages, as so defined, or at such other provisional rate as may from time to time be mutually agreed upon with the Government's audit representatives. This is a provisional rate for current reimbursement, which we have arrived at by negotiation with Government representatives, and it will be subject to retroactive revision to the "actual" rate agreed upon with them for each calendar year following a detailed audit for that year. The item of overhead includes general research, charges of $25 or less for materials and supplies, and other categories of costs we customarily include in our overhead account. Cash discounts on all purchases will be credited to overhead, instead of to the amount of the purchase. Scrap of appreciable value will be credited directly to the project. All other scrap will be credited to the overhead account, in which the Government participates.)

Total Estimated Cost	
Fixed Fee	
Contract Price	$2,998

*Please let us have your acceptance in our hands by April 17, 1959

Unless we extend the time, your acceptance after that date will be subject to agreement.

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